



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

# MSC FLIGHT READINESS REVIEW APOLLO 14,

## PART I :

MISSION SUMMARY ;  
MISSION RULES ;  
LUNAR MODULE }



MANNED SPACECRAFT CENTER HOUSTON, TEXAS  
DECEMBER 11, 1970

### INDEXING DATA

DATE	OPR	#	T	PGM	SUBJECT	SIGNATOR	LOC
12-11-70	MSC		V	APD	(Title)	MSC	073-15



## MISSION SUMMARY

300 LBS RESERVE

MISSION DURATION

TRANSEARTH FLIGHT TIME

LEI REV

SUN ELEVATION

REV NUMBER

BOOTSTRAP PHOTOGRAPHY

SUN ELEVATION AT LANDING

APPROACH AZIMUTH

LANDING REV

TRANSDUCER COAST TIME

LAUNCH TIME, F.S.T.

LAUNCH DATE

300 LBS

09 00 41M

03 HOURS

END OF 34

31.0 &amp; 22.0

4 &amp; 50 - 50

DESCENDERS

10.3.

-10.3.

14

80 HOURS

12:33

JANUARY 31, 1951

## EXPERIMENTS AND OBJECTIVES

## MAJOR NEW ACTIVITIES

## LAUNCH OPPORTUNITIES

## MISSION EVENTS

## MISSION SUMMARY

## FIRST LAUNCH MONTH

## MISSION EVENTS



MISSION EVENTS  
FIRST LAUNCH MONTH

FRA MAURO

LAUNCH DATE	JANUARY 31, 1971
LAUNCH TIME, E. S. T.	15:23
TRANSLUNAR COAST TIME	80 HOURS
LANDING REV	14
APPROACH AZIMUTH	-76.3°
SUN ELEVATION AT LANDING	10.3°
BOOTSTRAP PHOTOGRAPHY	DESCARTES
REV NUMBER	4 & 26 - 29
SUN ELEVATION	31° & 55°
TEI REV	END OF 34
TRANSEARTH FLIGHT TIME	67 HOURS
MISSION DURATION	9 <sup>d</sup> 0 <sup>h</sup> 41 <sup>m</sup>
3 $\sigma$ LOW SPS RESERVE	300 FPS

## LAUNCH OPPORTUNITIES

	<u>T-24</u>	<u>T=0</u>	<u>T+24</u>
FIRST MONTH		✓	
SECOND MONTH	✓	✓	*
THIRD MONTH	✓	✓	*

\* HEADQUARTERS APPROVAL PENDING.  
PLANNING PROCEEDING.



## EXPERIMENTS AND OBJECTIVES

- CONTINGENCY SAMPLE COLLECTION
- ALSEP
  - PSE, ASE, SIDE/CCIG, CPLEE, DUST DETECTOR
- LUNAR GEOLOGY
- BOOTSTRAP PHOTOGRAPHY
- CSM O<sub>2</sub> FLOW RATE
- LASER RANGING RETRO-REFLECTOR
- SOIL MECHANICS
- PORTABLE MAGNETOMETER
- VISIBILITY AT HIGH SUN ANGLES
- MET EVALUATION
- SELENODETIC REFERENCE POINT UPDATE
- DOWNLINK BISTATIC RADAR OBSERVATIONS
- CSM ORBITAL SCIENCE PHOTOGRAPHY

## EXPERIMENTS AND OBJECTIVES (CONT)

- EVA OPERATION LIMITS
- TRANSEARTH LUNAR PHOTOGRAPHY
- SOLAR WIND COMPOSITION
- THERMAL COATING DEGRADATION
- EVA COMMUNICATIONS
- GEGENSCHN FROM LUNAR ORBIT
- DIM LIGHT PHOTOGRAPHY
- S-BAND TRANSPONDER (CSM/LM)



# LUNAR SURFACE EXPERIMENTS AND OBJECTIVES

## EVA NO. 1

	0	10	20	30	40	50	60	1+10	1+20	1+30		
CDR	DEPRESS	EGRESS	FAM	MET OFF LOAD	MESA ADJ TV DEPLOY	S-BAND	ETB TRANSFERS	FLAG DEPLOY	IM & SITE INSPECT/ PHOTG	MET DEPLOY	ALSEP	
LMP	ASSIST CDR WITH EGRESS		EGRESS & FAM	MESA ACT	CSC	SWC	LR <sup>3</sup> OFFLOAD ASSIST W/S-BAND	INGRESS SW S-BAND EGRESS	FLAG DEPLOY	TV & PAN SITE SURVEY	MET DEPLOY	ALSEP
	1+30	1+40	1+50	2+0	2+10	2+20	2+30	2+40	2+50	3+0		
CDR	OFF-LOAD + FUEL	TRAVERSE	SITE SURVEY	ALSEP SYSTEM INTERCONNECT	PSE OFF LOAD	SUNSHELD DEPLOYMENT	ALSEP ANT INSTALL	PSE DEPLOY	LR <sup>3</sup> DEPLOY	ALSEP PHOTOS		
LMP	OFF-LOAD + FUEL	TRAVERSE	SITE SURVEY	ALSEP SYSTEM INTERCONNECT	THUM. GEOP. OFF LOAD	MORTAR PACK DEPLOY	CPLEE DEPLOY	SIDE/CCIG DEPLOY	GEOPHONE DEPLOY			
	3+00	3+10	3+20	3+30	3+40	3+50	4+00	4+10	4+15			
CDR	COMPREHENSIVE SAMPLE FOOTBALL	SAMPLING			RET TRAV.	EVA CLOSE-OUT	ETB TRANS	EVA TERM				
LMP	THUMPER ACTIVITY ACTIVITY	SAMPLING			MORT PKG ACT	RET TRAV.	EVA CLOSE- OUT	EVA TERM	ETB TRANS			



# LUNAR SURFACE EXPERIMENTS AND OBJECTIVES

## EVA NO. 2

		10	20	30	40	50	1+0	1+10	1+20	1+30
CDR	DEPRESS	EGRESS TRANSFER	MET LOAD	TRAV	STATION A THERM DEGRAD SAMP	PAN SAMP	DOUBLE CORE	TR	STATION B D,S	TRAVERSE TO CONE
LMP	DEPRESS	ETB	EGRESS ASST. MET LOAD	TRAV	LPM POINT MEAS		DOUBLE CORE	TR	D,S	TRAVERSE TO CONE

	1+30	1+40	1+50	2+0	2+10	2+20	2+30	2+40	2+50	3+00
CDR		CONE CRATER RIM D, 2 PANS, SAMPLES EVA COMM EVAL POLARIMETRIC (HD)			TRA- VERSE	STATION D D,S	TRAVERSE	STATION E D,P TRENCH, SAMPLES SINGLE CORE (HD)		
LMP		D, 2 PANS, SAMPLES EVA COMM EVAL ROLL BOULDERS			TRA- VERSE	D,S	TRAVERSE	LPM	D,P SAMPLES	

	3+00	3+10	3+20	3+30	3+40	3+50	4+00	4+10	
CDR	TR	STATION F D,P TRIPLE CORE	TR	STATION G D,P GAS, MAC (HD)	TR	CONT SAMP	EVA CLOSEOUT	TRANSFERS	EVA TERM
LMP	TR	RADIAL/DIAMETRID(HD) TRIPLE CORE D,P	TR	D,P LPM(HD) GAS, MAC (HD)	TR	CONT SAMP	EVA CLOSEOUT SWC STOW	INGRESS TRANSFERS	

# ORBITAL EXPERIMENTS AND OBJECTIVES

<u>OBJECTIVE</u>		<u>JANUARY 31 (LAUNCH)</u>
SELENODETTIC LANDMARK TRACKING		11
BOOTSTRAP PHOTOGRAPHY		
DESCARTES		REVS 4 AND 26 - 29
ORBITAL SCIENCE PHOTOS		
TOPO TARGETS		6
HANDHELD HASSELBLAD		8
DIM LIGHT PHOTOS		
GALACTIC LIGHT		2
ZODIACAL LIGHT		1
LUNAR LIBRATION		1
EARTHSHINE		1
GEGENSCHEIN		1
S-170 DOWNLINK BISTATIC RADAR		VHF AND S-BAND OMNI
VISIBILITY AT HIGH SUN ANGLES		4



## MAJOR NEW ACTIVITIES

- ACTIVE SEISMIC EXPERIMENT
- MOBILE EQUIPMENT TRANSPORTER (MET)
- SPS DOI
- LONGER EVA's
  - 4-1/4 HOURS NOMINAL WITH POSSIBLE EXTENSION TO 5 HOURS VERSUS 3-3/4 HOURS ON APOLLO 12
- INFLIGHT DEMONSTRATIONS
- SHORT RENDEZVOUS

## MISSION RULES



## MISSION RULE CHANGES

- LAUNCH/EARTH PARKING ORBIT
  - ATTITUDE DEVIATIONS DURING LAUNCH
  - IU NAVIGATION UPDATE CRITERIA
  - SM BATTERY EQUATED TO ONE FUEL CELL
- TRANSLUNAR INJECTION
  - S-IVB PROPELLANT REQUIREMENTS
  - OVERBURN SHUTDOWN CRITERIA
- LUNAR ORBIT INSERTION
  - SPS REQUIREMENTS RELAXED FOR CONTINUATION
  - OSS NOT REQUIRED
- DESCENT ORBIT INSERTION
  - OVERBURN SHUTDOWN CRITERIA
- DESCENT/LANDING
  - SPS PROPELLANT LEAKS
  - EITHER AUTO ULLAGE OR AUTO DPS IGNITION REQUIRED
  - EITHER AUTO OR MANUAL DPS THROTTLE REQUIRED
  - $T_1$  AND  $T_2$  NO-STAY CRITERIA DEFINED

## MISSION RULE CHANGES (CONT)

### ● LUNAR STAY/EVA

- EITHER PGNS OR AGS GUIDANCE REQUIRED
- BOTH CM RCS RINGS
- EVA'S PLANNED FOR 4.25 HOURS (EXTENDABLE TO 5.0 HOURS MAXIMUM)
- MAXIMUM DISTANCE
  - WITH BSLSS, APPROXIMATELY 3 KM
  - WITHOUT BSLSS, APPROXIMATELY 1 KM
- RESTRICTED OPERATIONS AFTER GRENADE LAUNCHER ASSEMBLY IS ENABLED

### ● ASCENT/RENDEZVOUS

- SHORT RENDEZVOUS REQUIRES REDUNDANT NAVIGATION CAPABILITY
- APS USED FOR TPI

### ● EFFECTS OF CSM LIFEBOAT ENHANCEMENT MODIFICATIONS

- CONTINUE MISSION WITH LOSS OF 1 CRYO O<sub>2</sub> TANK
- SM BATTERY WILL NOT BE USED
- CM WATER STOWAGE BAGS WILL NOT BE FILLED
- LM ASCENT STAGE WILL NOT BE RETAINED FOR SM BATTERY OR THIRD O<sub>2</sub> TANK FAILURES



## ALTERNATE MISSIONS

### ● EARTH ORBIT

- ONLY NEAR-CIRCULAR, LOW ALTITUDE ORBITS WILL BE USED

### ● LUNAR ORBIT

- PHOTOGRAPHY MISSION OBJECTIVES WILL BE COMPLETED
- FOLLOW NOMINAL MISSION TIMELINE AS MUCH AS PRACTICAL
- WILL NOT DO TLI IF LUNAR LANDING MISSION CANNOT BE FLOWN
- WILL DO LOI IN ORDER TO PERFORM LUNAR ORBIT MISSION
- CSM SOLO IS ACCEPTABLE

APOLLO 14 TRAINING SCHEDULE  
(AS OF 12/18/70)

<u>MISSION PHASE</u>	<u>ACCOMPLISHED</u>		<u>REMAINING</u>		<u>TOTAL</u>
	<u>MCC ALONE</u>	<u>MCC CREW</u>	<u>MCC ALONE</u>	<u>MCC CREW</u>	
FIDO/BSE	3		1		4
LAUNCH		2-1/2*		1	3-1/2
TLI	1	3-1/2**		1	5-1/2
TLC		2			2
LOI-DOI		2		1	3
LM ASCENT/DESCENT		3*		1	4
DESCENT		4-1/2**		2	6-1/2
LUNAR SURFACE/EVA	2	1		1	4
ASCENT		4*		1	5
TEI		1			1
ENTRY		1		1	2
ALSEP	2		3***		5
SIM OPTIONAL				1	1
TOTAL	<u>8</u>	<u>24-1/2</u>	<u>4</u>	<u>10</u>	<u>46-1/2</u>

\* ONE DAY WITH THE 15 CREW.

\*\* TWO DAYS WITH THE 15 CREW.

\*\*\* REMAINING ALSEP EXERCISES WILL BE RUN CONCURRENT WITH OTHER SIMULATIONS.



## LUNAR MODULE

## CARR SUMMARY



## LM-8 CARR SUMMARY

- A TOTAL OF 14 RFA's WERE GENERATED
- ALL HAVE BEEN CLOSED

FRR PRE-BOARD SUMMARY



## FRR PRE-BOARD SUMMARY

### ● 12 RFA's SUBMITTED BY SUBSYSTEM WORKING GROUPS

ACTION REQUIRED	4
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RFA's CLOSED	4
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RFA's TO BOARD	4
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	<hr/>
	12

### ● 6 GSE RFA's SUBMITTED

ACTION REQUIRED	0
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RFA's CLOSED	6
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RFA's TO BOARD	0
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	<hr/>
	6

## SNEAK CIRCUIT ANALYSIS OF LM-8

- LM-8 IS THE SIXTH LUNAR MODULE FORMALLY ANALYZED FOR SNEAK CONDITIONS
- MANUAL AND COMPUTER ASSISTED ANALYSIS OF DESIGNED CONFIGURATION AND CHANGES
- MAIN EMPHASIS ON COMPUTER-LOCATED PATHS IN ALL SWITCH AND RELAY CIRCUITRY, EXPLOSIVE DEVICES, CONTROL ELECTRONICS, DISPLAYS/CONTROLS AND INSTRUMENTATION/COMMUNICATION SUBSYSTEMS
- ALL FLIGHT PHASES, ABORT STAGING, AND LANDING WERE TREATED
- FORM OF REPORT
  - DOCUMENTED RESULTS - D2-118356-1



## SNEAK CIRCUIT ANALYSIS OF LM-8 FINDINGS AND READINESS STATUS

- 95 PERCENT ANALYSIS COMPLETED. THIS IS A 13 PERCENT INCREASE OVER LM-7
- TWO NEW SNEAK CIRCUIT BULLETINS RELEASED AND DISPOSITIONED BY ASCB REVIEW BOARD:
  - LM-8-001      CRITICAL CIRCUITS DIODED TO GROUND      NO CHANGE NEEDED, DESIGN ADEQUATE
  - LM-8-002      LOSS OF S-BAND TRANSCEIVERS      REMOVE REDUNDANT CIRCUIT TO AVOID SNEAK ACTUATION
- NO FLIGHT CONSTRAINTS KNOWN IN THE SYSTEM PORTION ANALYZED

## NONMETALLIC MATERIALS SUMMARY



## NONMETALLIC MATERIALS SUMMARY

### LM-8

- ALL NONMETALLIC MATERIALS USED IN THE LM ARE CONTROLLED BY COMAT (CHARACTERISTIC OF MATERIALS) DATA SYSTEM
- CFE
  - A REVIEW OF COMAT RESULTED IN 27 CCB APPROVED DEVIATIONS
- GFE
  - A REVIEW OF COMAT RESULTED IN 25 CCB APPROVED DEVIATIONS
- SELECTION REQUIREMENT EXCEPTIONS
  - ALL MATERIALS WHICH FAIL STANDARD SELECTION REQUIREMENTS MUST BE APPROVED BY MATERIALS DEVIATIONS FOR CFE OR GFE PRIOR TO USE AS EXCEPTIONS
- FLAMMABILITY TESTING
  - NO FLAMMABILITY TESTING REMAINS UNRESOLVED IN SUPPORT OF LM-8

## SUMMARY OF NONMETALLIC MATERIALS (NMM) DEVIATIONS

### ● DEVIATIONS APPROVED BY MSC CONFIGURATION CONTROL BOARD (CCB)

	LM-5	LM-6	LM-7	LM-8
CFE	26	27	26	27
GFE	26	26	26	25
TOTAL	52	53	52	52

### ● TOTAL WEIGHT AND SURFACE AREA OF DEVIATED NMM

	LM-5	LM-6	LM-7	LM-8
WEIGHT, LB	18.40	18.48	16.17	14.16
SURFACE AREA, IN <sup>2</sup>	9,515	10,008	6,396	3,676



LM CATEGORY D

## SUMMARY OF NONMETALLIC MATERIALS (NMM) DEVIATIONS (CONT)

- TYPICAL EXAMPLES OF DEVIATED NMM IN LM-8
  - SOLDER AND CRIMPED SPLICES AND ID SLEEVES (KYNAR)
    - APPROXIMATELY 1.1 POUNDS
    - ALL CASES OF 6 OR MORE SPLICES IN CLOSE PROXIMITY ARE WRAPPED WITH NON-FLAMMABLE TAPE
  - ONBOARD DATA BOOKS (PAPER)
    - 4 POUNDS PLUS STOWED DURING LAUNCH, RESTOWED AFTER USE

## LM CATEGORY D

- 63 MATERIALS REQUIRE TESTS
- 62 MATERIALS RECEIVED AT MSC THE WEEK OF DECEMBER 7, 1970
- ONE REMAINING MATERIAL WILL BE SHIPPED BY DECEMBER 15, 1970
- ALL TESTING SCHEDULED FOR COMPLETION JANUARY 20, 1971

## LM CATEGORY J

- GAC REVIEW INCOMPLETE - ESTIMATE 60 MATERIALS THAT REQUIRE TESTING
- ESTIMATE SHIPMENT DECEMBER 21, 1970 OF ALL CATEGORY J MATERIALS FROM GAC
- 12 MATERIALS WERE TESTED FOR APOLLO 13, PANEL 6
- ESTIMATE COMPLETION OF TESTING JANUARY 20, 1971

## GFE CATEGORY D

- 32 PLSS MATERIALS REQUIRE TESTING. SCHEDULE WILL BE AVAILABLE DECEMBER 11, 1970



